

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
13 January 2005 (13.01.2005)

PCT

(10) International Publication Number  
**WO 2005/004054 A3**

(51) International Patent Classification<sup>7</sup>: **B32B 31/00**,  
31/20, 31/26, 33/00, B41M 3/12, B44C 1/17

7TX (GB). NERI, Kenneth [US/US]; 32 Canochet Trail,  
Cranston, RI 02921 (US).

(21) International Application Number:  
PCT/US2004/020225

(74) Agents: JOSEPHS, David, R. et al.: Barlow, Josephs &  
Holmes, Ltd., 101 Dyer Street, 5th Floor, Providence, RI  
(US).

(22) International Filing Date: 25 June 2004 (25.06.2004)

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,  
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/482,732 26 June 2003 (26.06.2003) US

(71) Applicant (for all designated States except US): KEY-  
TECH, INC. [US/US]; 128 Bay State Avenue, Warwick,  
RI 02888 (US).

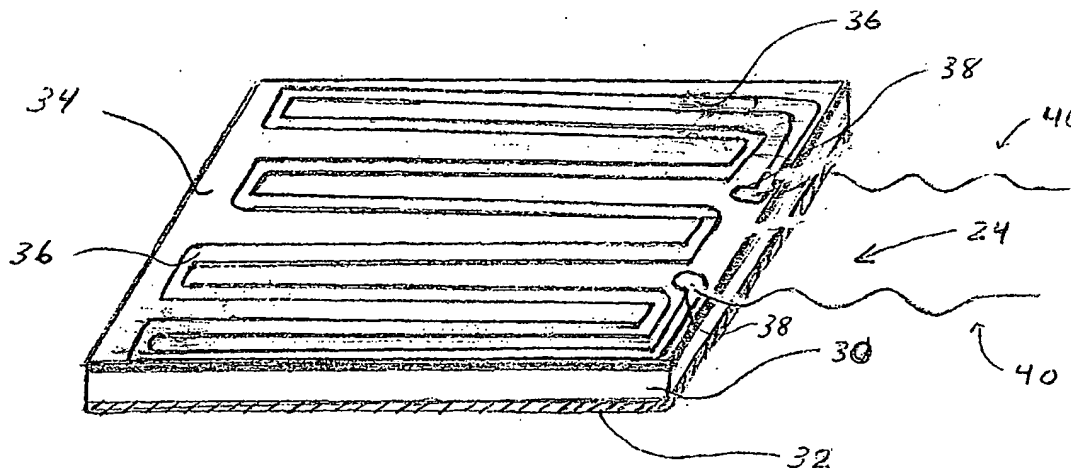
(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SI, SK,  
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): FERGUSON,  
Patrick [GB/GB]; 22 Wenlock Drive, North Shields NE29  
9HD (GB). NEWTON, Paul, Geoffrey [GB/GB]; 1 West  
Meadows Road, Cleadon, Sunderland, Tyne & Wear SR6

[Continued on next page]

(54) Title: METHOD FOR THERMALLY PRINTING A DYE IMAGE ONTO A THREE DIMENSIONAL OBJECT USING FLEXIBLE HEATING ELEMENTS



(57) Abstract: The present invention relates to a method for thermally printing a pre-selected dye image (45) onto a three dimensional object (16). The method involves placing an image carrier sheet (24) containing a pre-selected dye image (45) over the object (16). A flexible membrane (26) is lowered over the object (16) and the image carrier sheet (24). A vacuum is established under the membrane (26) causing the image carrier sheet (24) to conform to the shape of the object (16). The membrane (26) or image carrier sheet (24) carry flexible heating elements (36), which are heated, to thermally transfer the dye image (45) onto the object (16). The flexible heating elements (36) can be made by etching an electrical circuit in a metal foil (34) which is bonded to a film substrate (30).



**Published:**

— with international search report

**(88) Date of publication of the international search report:**

24 February 2005

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*